

is rising rapidly. Should there be any danger of a freshet in the lower Willamette River special reports will be obtained Thursday and the public notified."

The river rose rapidly during the next few days and finally reached a stage of 22.0 feet at Eugene, on the 25th; 31.5 feet at Albany, on the 26th; 29.0 feet at Salem, on the 27th, and 19.3 feet at Portland, on the 28th. Accurate and timely warnings were sent to up river points on the 24th and 25th, and the public in Portland were equally as well informed of the stages about to occur in the lower end of the valley.

The chart of rainfall and the hydrographs below it, fig. 1, show graphically the cause of the flood together with the stages reached at the river stations reporting to this center.

The flood caused widespread damage of the usual character though very fortunately no lives were lost. Railroad beds were washed out; bridges, houses, barns, and outbuildings were carried away; millions of feet of logs were torn from their

moorings and carried down the river; farm lands were overflowed, and much live stock and other portable property destroyed. The damage, however, could not have been prevented, and was limited to property that could neither be removed nor protected when the warnings were issued.

The highest and lowest water, mean stage, and monthly range at 162 river stations are given in Table VII. Hydrographs for typical points on seven principal rivers are shown on Chart V. The stations selected for charting are Keokuk, St. Louis, Memphis, Vicksburg, and New Orleans, on the Mississippi; Cincinnati and Cairo, on the Ohio; Nashville, on the Cumberland; Johnsonville, on the Tennessee; Kansas City, on the Missouri; Little Rock, on the Arkansas; and Shreveport, on the Red.—*H. C. Frankenfield, Forecast Official.*

CLIMATE AND CROP SERVICE.

By JAMES BERRY, Chief of Climate and Crop Service Division.

The following summaries relating to the general weather and crop conditions during January are furnished by the directors of the respective sections of the Climate and Crop Service of the Weather Bureau, and are based upon voluntary reports from meteorological observers and crop correspondents, of whom there are about 3000 and 14,000, respectively:

Alabama.—Precipitation deficient, but rains so frequent as to retard all farm work. Oats slightly damaged by cold during middle of month. Last week warm enough to cause fruit buds to swell. Oats and wheat promising. Some corn and cotton land being prepared, and preparations for early trucking crops getting under way during last decade.—*F. P. Chaffee.*

Arkansas.—The weather was generally unfavorable for plowing and preparing the ground for the coming season's crop, and very little work of this nature was done. Considerable late matured cotton remained in the fields at the month, but on account of the weather conditions and the nearness of the time to prepare the ground for the next season's crop, much of this will remain ungathered. Winter wheat and oats appeared to be in good condition. Fruit trees were apparently uninjured.—*Edward B. Richards.*

Arizona.—Cold weather prevailed during part of the month, and the temperature was generally above the normal. There was a decided deficiency of precipitation, and at many stations there was none whatever. The cold weather caused some damage to growing crops, and plowing was delayed somewhat by frozen ground. As a rule, however, agricultural prospects in this territory were excellent. In many localities they were reported to be the best for years. The ranges were in good condition and grain was doing well.—*M. E. Blystone.*

California.—Cold, cloudy, and foggy weather continued until about the 20th, greatly retarding the growth of all vegetation. A few days of warm weather, accompanied by heavy rain, toward the close of the month caused a rapid growth of grain and grass and greatly benefited orchards. The heavy rain in northern California caused a rapid rise of creeks and rivers, damaging grain and other property to some extent.—*Alexander G. McAfee.*

Colorado.—In the mountain districts, in common with the plains region, dry weather characterized the first and second decades of January. The last decade, however, was stormy, while the precipitation was generally greater than for January, 1902, yet in only a few localities on the different watersheds was the total brought near the normal. The snow is packed hard in huge drifts in the gulches and timber, where it has been swept by the prevailing high winds; the outlook was favorable to a steady flow of water.—*F. H. Brandenburg.*

Florida.—The month was favorable for vegetables, except on some low lands, where the soil was too wet. Cabbages, Irish potatoes, tomatoes, and other vegetables were available in goodly amounts. Celery made poor progress, owing to unseasonably warm weather. The coldest weather occurred during the first decade, when freezing conditions prevailed to the lower portion of the central district. Citrus trees were well advanced, some showed bloom. Peach trees, generally, were in bloom. Some corn was planted during the last decade.—*A. J. Mitchell.*

Georgia.—The temperature for the month was below the average, but the weather was not at any time severe. The 13th was generally the coldest day. The 29th was very warm for the season. The rainfall was below the normal in the northern and middle sections and slightly above in the southern. The month was characterized by a preponderance of cloudy and rainy days. Winter wheat and oats passed through the month favorably. Stock was reported in good condition. Plowing was well advanced for the season in some of the central counties. The outlook for fruit at the close of the month was propitious.—*J. B. Marbury.*

Idaho.—Fair weather, with moderately low temperature, prevailed from the 5th to 16th. From the 17th to close of the month daily pre-

cipitation occurred in nearly all parts of the State. Heavy snow fell on all the mountains and in high plateau sections, consequently the accumulated snow at the close of January was the greatest for at least the past five years. Winter stock ranges were covered with snow to an unusual depth, necessitating more general feeding of stock than for many years. Fall sown wheat had a good snow protection.—*S. M. Blandford.*

Illinois.—The weather was remarkably mild, except a brief cold spell from the 8th to the 13th. The average temperature was slightly above normal. Precipitation was deficient but well distributed. The average condition of wheat was good; some injury to the crop ensued in the southern district from alternate freezing and thawing. The rye crop was thriving. Conditions were favorable for meadows and grasses. Fruit trees remained uninjured.—*W. G. Burns.*

Indiana.—Wheat was well protected by snow during the greater part of January and when, near the last of the month the ground became bare, the crop, with few exceptions, was found to be in excellent condition. The exceptions were fields that had been planted prior to September 25 and damaged by flies before winter began. The weather and condition of the ground were not favorable for field work, and considerable corn remained unhusked at the close of the month. Live stock of all kinds was wintering in good condition.—*W. T. Blythe.*

Iowa.—The month was unusually favorable for stock feeding and for gathering the unharvested portion of the corn crop. Fall wheat and rye, of which a very small acreage was sown, was not materially damaged by freezing weather.—*John R. Sage.*

Kansas.—The mild weather was favorable to outdoor work and corn husking progressed rapidly; some plowing was done in the south the latter part of the month. Wheat looked well but needs moisture.—*T. B. Jennings.*

Kentucky.—The condition of wheat was generally encouraging at the end of the month. In the western portion of the State some fields in low, wet land seemed to have been injured somewhat by freezing and thawing, but in the central and eastern portions it looked very promising. Very little work was done in preparing tobacco beds. Farm stock was in good condition and feed was fairly plentiful. Fruit trees appeared to be doing well.—*H. B. Hersey.*

Louisiana.—Unfavorable weather for agricultural interests prevailed during the greater part of the month. Frequent showers kept the ground too wet for tillage, and preparation for planting spring crops progressed slowly. There was too much rain for sugar cane, and it was feared that a continuation of wet weather will injure seed cane. Preparations for rice seeding were pushed as rapidly as possible. Winter truck gardens have made splendid growth. The weather was favorable for oranges.—*I. M. Cline.*

Maryland and Delaware.—Temperature normal; precipitation abundant and fairly well distributed. Winter growth received ample and protective snow covering in the northern and western counties, but in the south and east the ground was bare most of the month. Wheat was in fine condition in the first-named area; elsewhere early sown was fair, barring local injury by fly; late sown wheat was injured somewhat by frequent freezing and thawing. Grasses were in good condition. Ground was generally too wet for farm work.—*Oliver L. Fassig.*

Michigan.—The weather conditions during January were favorable for winter wheat and rye: the ground was well protected with snow until the 27th, when it was partly uncovered by rains in portions of the central and southern sections. There was very little alternate freezing and thawing, and correspondents, as a rule, reported little or no damage of any kind. The wheat plant was rather small on account of the late seeding last fall, but appeared green and healthy. On account of ample snow protection during the most severe weather there was very little frost in the ground.—*C. F. Schneider.*

Minnesota.—The maximum temperatures occurred for the most part on the 6th and 26th, and the minimums on the 11th and 30th. The minimum temperatures were not at all low for January. Snow covered the

State the whole of the month, the depth ranging from about 6 inches in the open country to much greater depths in the timbered regions. Work in the logging camps was considerably hindered by the accumulations of snow. The gathering of a splendid ice crop has been going on practically the whole month, the thickness in places being 30 inches.—*T. S. Outram.*

Mississippi.—There were only two periods of marked abnormal temperature; one, the coldest period of the month, obtained from the 9th to the 14th, and the other, the warmest period, prevailed from the 26th to the 29th, inclusive. The precipitation was well distributed throughout the month and over the State. Excessive rainfalls were not so frequent as usual. A light snow and sleet storm occurred in the central and southern counties on the 14th.—*W. S. Belden.*

Missouri.—In most sections of the State the weather was unfavorable for winter wheat. Except in a few of the northeastern counties the crop received but little protection from snow, and in portions of the central and southern sections it was injured to some extent by alternate thawing and freezing. In most of the northern counties, however, wheat was reported in good condition at the close of the month.—*A. E. Hackett.*

Montana.—January was an unusually mild month; ranges in portions of the Milk and Missouri River valleys were covered with hard crusted snow; conditions very favorable elsewhere.—*Montrose W. Hayes.*

Nebraska.—The warm, dry weather allowed rapid progress to be made in gathering corn, and the crop was about all secured at the end of the month. The ground was covered with snow during a very small portion of the month; however, the high temperature and absence of severe wind made it a most favorable month for fall sown grain. Winter wheat was affected but little by the weather, and with but few exceptions was reported in excellent condition.—*G. A. Loveland.*

Nevada.—The weather of the month was remarkably fine and clear during the first and second decades. The last decade, however, was more or less stormy, with good rains in the valleys and heavy snows on the mountain ranges. At the close of the month the depth of snow in the canyons and gulches was considered amply sufficient to maintain a normal flow of water during the summer months. The weather conditions were generally favorable to stock interests.—*J. H. Smith.*

New England.—The weather was somewhat warmer than usual, with the temperature above normal in about all sections. The precipitation was about normal and was well distributed throughout the month and over the district. The weather was fairly favorable to outdoor pursuits, and especially for lumbering and ice interests. Reports from sections in Connecticut indicate that peaches were probably injured by the extremely low temperatures of December.—*J. W. Smith.*

New Jersey.—The prevailing weather conditions were unfavorable to winter grain, as the ground was bare of snow from the 1st to 6th, and from 12th to 25th; much freezing and thawing occurred. Wheat and rye were deadened slightly at the tops and the fields looked yellow, but no serious injury has been done. Fruit trees were in good condition.—*Edward W. McGann.*

New Mexico.—A mild month with good weather. Although unusually dry, all reports indicate that stock retained good condition. West of the Rio Grande and throughout the central part of the Territory the soil was moist to a considerable depth.—*R. M. Hardinge.*

New York.—Conditions generally favorable for wheat and rye, most sections reporting ample snow protection, but some damage by sudden temperature changes. Very little frost in ground. General rains and thaw from 27th to 29th.—*R. G. Allen.*

North Carolina.—Frequent rains, absence of snow covering, and alternate freezing and thawing were rather unfavorable for wheat, but the injury was slight, owing to the excellent start the plants had secured. Crops in lowlands were injured by excessive moisture. At the close of the month early seeded winter wheat, oats, and rye were healthy and vigorous, good stands were secured, and the plants were spreading nicely. Late seeded cereals, however, made comparatively little growth. Prospects remain exceptionally favorable.—*C. F. von Herrmann.*

North Dakota.—The month was warmer than usual, with but little snow until the latter part, when heavy snow fell in nearly all sections of the State. Owing to this covering of snow on the ground feeding of stock, that had before grazed on the prairies, became necessary.—*B. H. Bronson.*

Ohio.—Temperature and precipitation slightly deficient. Wheat continued in excellent condition; it was well protected by snow during all of the cold weather and no injury whatever was reported. The snowfall was generally less than normal for the month, but the weather turning cold after each storm caused it to remain on the ground for a considerable period of time to the benefit of grain and grass. Fruit buds were uninjured. Stock was in good condition.—*B. L. Waldron.*

Oklahoma and Indian Territories.—Moderately cool weather and below average precipitation, except during the last week, tended to retard crop growth, yet wheat was well rooted, and wheat, winter rye, and volunteer oats made good progress. Plowing for corn, oats, and early potatoes was well advanced. Stock continued on wheat or range and did well, except in the Choctaw Nation, where conditions were unfavorable and considerable loss was reported. Cotton picking continued. Fruit trees were reported in good condition.—*C. M. Strong.*

Oregon.—In the western section of the State the first half of the month was favorable for plowing and some progress was made with this work.

Not much seeding, however, was done, as, before the ground was properly prepared, a rainy spell set in and farm work came to a standstill. In the eastern section practically no plowing or seeding was done during the month. Fall wheat in portions of Umatilla and Union counties is thought to have been damaged in places by alternate thawing and freezing, and it is estimated that about a fourth of the crop will have to be reseeded. Elsewhere fall wheat came up nicely, although its growth has been unusually slow. Winter pasturage was the poorest for a number of years.—*Edward A. Beals.*

Pennsylvania.—No protracted warm or cold spells occurred. The average precipitation was slightly above the normal, about an inch greater than that for the same period last year, and the heaviest for any January since 1898. The ground was fairly well covered with snow in nearly all agricultural districts during the coldest weather, and the conditions were in the main favorable to winter grain and grasses. No complaints of severe weather injuring fruit prospects were received.—*T. F. Townsend.*

Porto Rico.—Weather generally favorable, except a little too dry for very young crops and recently planted seed toward the end of the month. Young canes have done well and the maturing ones have improved. Grinding has become quite general, with fairly satisfactory results. The sowing, the cultivating, and the cutting of tobacco was carried on successfully, excepting the delay occasioned by the dry weather near the end of the month. Coffee trees pruned and put in order for the new crop; prospects good for early flowering. Small crops generally good and abundant but in need of rain; pasturage excellent.—*E. C. Thompson.*

South Carolina.—Temperature conditions as well as precipitation were favorable for trucking interests near the coast, while in the interior wheat and oats were uninjured and maintained a very promising condition. Country roads were, as a rule, in bad conditions, restricting the hauling of fertilizers. Some tobacco beds were prepared and seeded, but plowing was impracticable.—*J. W. Bauer.*

South Dakota.—The precipitation was comparatively light, and considerable of the month was more pleasant than usual. Except west of the one hundred and first meridian, compacted December snowfall remaining on the ranges materially interfered with the winter grazing of live stock and caused some slight loss of unacclimated cattle. A severe northwest gale on the 6th damaged some windmills and small farm out-buildings, two men and some cattle being killed in a barn that was wrecked, and in several towns damaged some chimneys and weak structures.—*S. W. Glenn.*

Tennessee.—The first half of the month was cold, with light rains and snow; the second half warmer, with but little rain, but the weather was generally cloudy. Alternate freezing and thawing had a bad effect on winter grain, especially late sown, causing much injury in the western division. Early sown grains acquired good root before the severe frosts and withstood them well. Low temperatures were beneficial in checking growth. Clover was in fair condition; but little plowing was done.—*H. C. Bate.*

Texas.—Showers were frequent during the month and the distribution of precipitation was normal, being heaviest over the eastern and southeastern districts and lightest in the western and northwestern counties. No pronounced changes in temperature were recorded, and so far the winter has passed without the prevalence of severe freezes. The soil and subsoil are thoroughly stocked with moisture, the precipitation for the preceding fall and winter months being the heaviest since records of such data began. Wheat and other cereals continued to make vigorous growth and were in excellent condition and stooling well; there was minor injury reported to wheat by insects and excessive precipitation in limited areas in the north-central portion. The breaking of land was very backward, but at the close of the month was well under way. Limited acreage was seeded to oats and corn during the month, and in the extreme southern counties preparations for cotton planting were in progress. Extensive shipments of vegetables were made during the month, and strawberries were on the market. Stock continued to winter very satisfactorily.—*Edward H. Bowie.*

Utah.—Very little farm work was done during the month. The heavy precipitation gave the ground a good soaking. Fall grain continued in fair condition and most of it had a good covering of snow at the close of the month. Stock generally continued in fair condition.—*L. H. Murdoch.*

Virginia.—The temperatures obtaining throughout the month were about normal, while the precipitation was in excess and came mainly as rain. Crop progress was much retarded by the soaked condition of the ground, and in some localities rust was reported in the winter wheat and oats. The hessian fly was in evidence in some fields in the southwestern part of the State, but the damage from this source was small.—*Edward A. Evans.*

Washington.—The month was notably mild, especially in the first decade, when heavy rains fell, greatly swelling the streams and causing floods. There was no severe weather to injure wheat, although there may have been slight damage by alternate thawing and freezing. Snow covered the ground at the end of the month.—*G. N. Salisbury.*

West Virginia.—During the period of hardest freezing wheat was generally well protected by a good covering of snow, but, during the second cold spell there was not much snow, and the late sown wheat was damaged slightly. At the close of the month, wheat was reported to be in good condition, as were also rye, oats, and grass. Practically no plow-

In the following table are given, for the various sections of the Climate and Crop Service of the Weather Bureau, the average temperature and rainfall, the stations reporting the highest

and lowest temperatures with dates of occurrence, the stations reporting greatest and least monthly precipitation, and other data, as indicated by the several headings:

Summary of temperature and precipitation by sections, January, 1902.

Section.	Temperature—in degrees Fahrenheit.						Precipitation—in inches and hundredths.					
	Section average.	Departure from the normal.	Monthly extremes.				Section average.	Departure from the normal.	Greatest monthly.		Least monthly.	
			Station.	Highest.	Date.	Station.	Lowest.	Date.	Station.	Amount.	Station.	Amount.
Alabama	43.8	-1.0	Prattville	84	29	Hamilton, Riverton	10	13	Daphne	5.61	Burkville	1.95
Arizona	46.4	+1.4	Chambers Camp	81	6	Fort Defiance	-2	1	Prescott	0.74	12 stations	0.00
Arkansas	40.2	-0.4	Texarkana, Warren	80	29	Eureka Springs	7	12	Lake Village	5.29	Silver Spring	0.42
California	46.6	+0.4	Indio	90	14	Bodie	-19	29	Crescent City	24.38	8 stations	0.00
Colorado	25.9	+1.8	Blaine	73	28	Gunnison	-35	1	Ruby	4.73	2 stations	0.00
Florida	57.2	-0.2	Flamingo	88	25	Holt, Wausau	18	9	Fort Meade	9.14	Bonifay	3.15
Georgia	44.6	-0.8	Fleming	87	29	Diamond	11	12	St. Marys	6.70	Waynesboro	1.32
Idaho	26.2	+0.9	Garnet	60	24	Dickey	-19	28	Silver City	7.86	Pollock	0.53
Illinois	27.0	+0.5	Centralia	70	28	Philo	-12	13	Olney	2.94	Antioch	0.35
Indiana	27.3	-1.6	3 stations	67	29	Topeka	-21	12	Bloomington	4.44	Topeka	0.83
Iowa	23.0	+3.5	Belknap	60	1	Clear Lake	-12	11	Fort Madison	1.46	8 stations	T.
Kansas	32.2	+3.1	Englewood	76	6	Moran	-8	12	Columbus	1.15	4 stations	T.
Kentucky	34.8	-0.5	Williamsburg	82	30	Williamstown	-9	12	Owenton	3.78	Franklin	1.44
Louisiana	48.8	-2.0	4 stations	84	26-29	Ruston	14	12	Amite	9.76	Farmerville	2.54
Maryland and Delaware	31.6	-0.4	Annapolis, Md	62	28	Boetcheville, Md	-6	14	Bachmans Valley, Md	6.08	Denton, Md	2.30
Michigan	20.7	-0.2	Traverse City	55	1	Grantsville, Md	-32	19	Cassapolis	4.45	Eagle Harbor	0.21
Minnesota	11.3	+1.0	Dundee, Grape	55	29	Humboldt	-32	14				
Mississippi	45.0	-1.6	New Ulm	45	6	Pokegama Falls	-39	14	Moorhead	1.18	Rolling Green	T.
Missouri	31.5	+1.1	Walnut Grove	83	29	Ripley	-12	13	Thornton	8.45	Holly Springs	3.41
Montana	25.7	+4.5	Caruthersville	73	29	Appleton City	-11	12	Caruthersville	3.45	Rockport	0.06
Nebraska	27.0	+6.1	Augusta	63	5	Glendive	-30	28	Summit	8.50	Poplar	T.
			Aurora	63	25	O'Neill	-14	11	Gordon	0.80	5 stations	0.00
Nevada	32.0	+5.1	Rioville	72	26	Agee, Purdum	-14	12				
New England	22.8	+1.1	Potts	57	2		-16	29	Lewers Ranch	7.40	Rioville	0.11
New Jersey	30.4	+0.3	Van Buren, Me.	57	2		-37	25	Durham, N. H.	6.05	Patten, Me	1.60
New Mexico	35.0	+1.6	5 stations	57	3, 28, 30	Layton	-5	14, 20	Paterson	5.04	Layton	2.81
New York	22.8	+0.7	Roswell	80	28	Taos	-1	20	Fort Bayard	0.78	Lordsburg	0.00
North Carolina	40.0	-0.2	Otto	53	30	Adirondack Lodge	-38	19	Number Four	6.16	Auburn	0.89
			Rockingham, Wash-	73	29	Linville	1	13	Statesville	6.43	Asheville	1.61
			ington									
North Dakota	9.4	+2.7	Fort Yates	56	6	Cando	-37	12	Berlin	1.65	McKinney	T.
Ohio	27.1	-1.1	Hanging Rock, Portsmouth	73	29	Milligan	-13	10	Lancaster	4.25	Swanton	0.94
Oklahoma and Indian Territories	39.2	+1.4	Ural, Okla	81	28	Blackburn, Okla	6	11	Tulsa, I. T.	2.10	4 stations	T.
Oregon	37.2	+2.2	Fairfield, I. T.	6	12		-8	16				
Pennsylvania	26.9	-0.6	Heppner	66	6	Pine	-13	20	Glenora	28.39	Umatilla	0.33
Porto Rico	74.2	+0.3	California	68	29	Dyberry	-48	6	Seisholtzville	5.09	Erie	1.49
South Carolina	43.7	-1.1	Moravia	92	21	Adjuntas	13	13	Maunabo	4.73	Coamo	T.
South Dakota	17.7	+0.8	Yemassee	77	29	Liberty	-24	12	Georgetown	7.10	Walhalla	2.40
Tennessee	38.6	-0.4	Spearfish	62	5	Pine Ridge	-24	12	Sisseton Agency	0.69	6 stations	T.
Texas	48.2	-0.2	Ashwood	77	29	Erasmus	1	9	Iron City	5.52	Leadville	1.20
Utah	27.0	+0.6	Fort Ringgold	91	29	Paris	-21	29	Trinity	5.49	Amarillo	0.12
Virginia	35.3	-0.1	St. George	66	5	Woodruff	-21	29	Huntsville	7.72	2 stations	0.00
Washington	35.6	+2.4	Bigstone Gap	68	29	Stanardsville	0	13	Lynchburg	5.31	Cape Henry	1.93
West Virginia	31.8	+0.0	Mattingsers Ranch	60	3	Republic	-2	26	South Bend	18.83	Sunnyside	0.17
Wisconsin	16.0	+1.8	Echo	79	29	Travellers Repose	-7	19	Pickens	6.45	Summersville	1.55
Wyoming	24.2	+1.9	Brodhead	55	29	Grantsburg	-29	11	New Holstein	1.60	Florence	T.
			3 stations	60	5, 6, 15	Border	-27	12	Thayne	2.65	Hyattville	0.00

ing was done during the month. Stock was generally in good condition, with prospect of sufficient feed.—*E. C. Vose.*

Wisconsin.—The temperature conditions during the month were slightly above normal, with no unusually sudden or pronounced changes decidedly cold weather prevailed during the second and third decades, but there was generally sufficient snow on the ground to protect winter crops. The precipitation was deficient throughout the State, but was heaviest over the east-central counties. However, no serious deficiency in moisture was reported from any point.—*J. W. Schaeffer.*

Wyoming.—No severe storm was general over the State during the month, but over the southwestern and southern sections snow was quite general during the last decade of the month. The snowfalls of the months of December and January have furnished a good stock of snow for irrigation water the coming season, except over the northeastern portion of the State, where a marked deficiency of snow existed at the close of the month.—*W. S. Palmer.*

SNOWFALL AND WATER SUPPLY IN THE ROCKY MOUNTAIN REGION.

The following extracts are taken from the snow bulletins for January, 1903, prepared by the Section Directors of Climate and Crop sections in the Rocky Mountain region:

Colorado.—In the mountain districts, in common with the plains region, dry weather characterized the first and second decades of January, but the last decade was stormy. Although the precipitation was generally greater than for January, 1902, yet in only a few localities on the different watersheds was the total brought near the normal. The snow is in excellent condition for a steady flow, as it is hard packed in huge drifts in the gulches and timber, where it has been swept by the prevailing high winds.

Idaho.—The heavy falls of snow during November and December were

equaled or exceeded by the January snowfall, consequently the accumulated snow lies to an unusual depth on all the mountains of the State. An abundance of water for all purposes is assured without further snow during the remainder of the winter. Farmers throughout the irrigation districts are elated with the prospect of an abundance of water for crops during the coming crop season, while lumbermen and farmers in northern counties fear high water when the snow begins to melt.

Montana.—On the west side of the main divide the snowfall was somewhat greater than on the east side. In Flathead County drifts are deep and firm in the mountains, but there is not much snow in the valley; it was melted by chinooks, but froze before reaching the streams. The Bitter Root Valley is covered with 3 to 10 inches of snow, and the mountains in Ravalli County are heavily covered. The fall was light in Granite County and was unevenly distributed in Deer Lodge and Powell counties—being above normal in some localities and much below in others. In western Missoula County there is an average amount of snow and the fall has been quite heavy in the mountains; there is but little in other portions of the country.

Nevada.—Reports indicate that the stock of snow now in the mountains over the watersheds of the State is amply sufficient to maintain a normal flow of water next summer without further precipitation during the remainder of the winter. Stockmen and ranchers are correspondingly happy over the fine prospects for a good crop season.

New Mexico.—It seems to be the consensus of opinion that with the exception of the watersheds of the Canadian and tributaries, the present season thus far shows a better prospect for an abundant water supply in the streams of the Territory than for some years past. At the close of January there was very little snow lying on the ground below 8000 feet. Above 10,000 feet, in the northern mountains, the average depth was from 3 to 4 feet on north sides, but on south and east sides there were frequent bare spots. However, the exceedingly heavy winds during the last week in January, although a potent evaporating agent,

doubtless proved more advantageous than otherwise by filling the mountain canyons with the drifting snow. With the exception of the northeastern quarter of the Territory, which has been unusually dry throughout the past fall and winter, the prairie soil at the present writing is in very good condition for the early start of spring grass, and there is every prospect for a good water supply.

Utah.—The snowfall of the month was excessive over the Great Salt Lake and the Sevier Lake watersheds and deficient over the watersheds of the Green and Colorado rivers. The fall over the Great Salt Lake watershed was remarkably heavy and exceeds that for any January since 1890. The depth of snow in the mountains of the State is generally above average and greater than for several years. High winds during the month caused the snow to drift nicely and the temperature conditions were favorable for packing. The amount of snow now in the mountains and its drifted and solid condition assure all sections of the State an abundant

supply of water for irrigation throughout the whole of the coming crop season.

Wyoming.—The January snowfall was very unevenly distributed throughout the State, the northern and extreme eastern portions receiving but small amounts, while the western and southern counties received good falls. The marked deficiency of snow over the eastern slope of the Big Horn Mountains, noted in the December bulletin, still continues and reports from that section show that probably less than one-half of the usual depth now exists. Reports from the Laramie, Platte, Green, and Snake River watersheds show that a good stock of snow has already accumulated in the sections named, and depths are reported to be up to the average or above; in many localities the depths are much above the normal and a good supply of water for irrigation seems assured.

SPECIAL CONTRIBUTIONS.

HAWAIIAN CLIMATOLOGICAL DATA.

By CURTIS J. LYONS, Territorial Meteorologist.

OBSERVATIONS AT HONOLULU.

The station is at 21° 18' N., 157° 50' W. It is the Hawaiian Weather Bureau station Punahou. (See fig. 2, No. 1, in the MONTHLY WEATHER REVIEW for July, 1902, page 365.) Hawaiian standard time is 10^h 30^m slow of Greenwich time. Honolulu local mean time is 10^h 31^m slow of Greenwich.

The pressure is corrected for temperature and reduced to sea level, and the gravity correction, -0.06, has been applied.

The average direction and force of the wind and the average cloudiness for the whole day are given unless they have varied more than usual, in which case the extremes are given. The scale of wind force is 0 to 12, or Beaufort scale. Two directions of wind, or values of wind force, or amounts of cloudiness, connected by a dash, indicate change from one to the other.

The rainfall for twenty-four hours is measured at 9 a. m. local, or 7.31 p. m., Greenwich time, on the respective dates.

The rain gauge, 8 inches in diameter, is 1 foot above ground. Thermometer, 9 feet above ground. Ground is 43 feet and the barometer 50 feet above sea level.

Meteorological Observations at Honolulu, January, 1903.

Date.	Pressure at sea level.	Temperature.		During twenty-four hours preceding 1 p. m. Greenwich time, or 1:30 a. m. Honolulu time.								Total rainfall at 9 a. m., local time.	
				Temperature.		Means.		Wind.		Average cloudiness.	Sea-level pressures.		
		Dry bulb.	Wet bulb.	Maximum.	Minimum.	Dew-point.	Relative humidity.	Prevailing direction.	Force.		Maximum.		Minimum.
1	29.94	64	63.3	77	69	60.5	68	ne.	3	2	30.04	29.94	0.01
2	29.95	62	61.3	77	63	63.3	80	ne-n.	1-0	4	30.09	29.90	0.00
3	29.96	64	63.3	77	62	59.7	78	w.	1-0	3-0	30.00	29.91	0.00
4	30.04	67	59	76	62	63.0	84	w-nne.	0-3	6	30.07	29.94	0.02
5	30.08	65	57	72	66	52.0	69	nne.	4	4	30.14	30.04	0.00
6	30.04	60	56.5	72	62	52.0	53	ne.	3	3	30.10	30.02	0.00
7	29.90	70	64	74	56	55.0	67	e.	1-0	5-10	30.07	29.90	0.02
8	29.73	72	69.3	77	62	62.7	70	ssw.	3-4	8-2	29.92	29.72	0.22
9	29.92	63	59	75	67	62.3	77	w-nw.	4-0	10-2	29.91	29.72	0.00
10	29.90	67	64	75	57	56.5	74	sw-w.	1-0	3-0	29.98	28.86	0.00
11	29.87	69	68.5	75	59	66.3	86	se.	1-0	10	29.98	29.85	1.65
12	29.97	67	61.5	76	69	68.3	91	sw-w.	1-0	10-4	29.98	29.85	0.16
13	29.97	68	60.5	73	64	55.3	63	nne.	3	1	30.02	29.94	0.00
14	29.97	67	63	74	66	57.0	67	nne.	3	4-1	30.02	29.94	0.00
15	29.96	68	64	73	63	60.7	78	ne-n.	2-5	9-3	30.02	29.92	0.02
16	30.00	68	64.3	74	66	63.3	80	ne.	3	4	30.03	29.93	0.02
17	30.00	66	64	77	65	63.3	78	ne-se.	3	3	30.06	29.97	0.00
18	30.04	66	65.5	78	64	65.5	85	s.	2-0	4-1	30.07	29.97	0.00
19	30.06	62	60.7	78	65	66.0	80	s.	1-0	3	30.10	30.01	0.00
20	30.08	59	65.3	79	60	61.5	79	s.	0	3	30.14	30.01	0.00
21	30.07	71	65.5	79	63	65.3	80	s-e.	0	4	30.16	30.04	0.00
22	30.10	69	64	79	66	62.3	68	se-e.	1-0	5	30.16	30.07	0.00
23	30.05	65	62	78	63	61.7	74	se.	1-0	3	30.13	30.03	6.00
24	30.04	69	64	77	62	62.7	80	s-ne.	2-0	8-2	30.14	30.02	0.00
25	30.02	66	62.5	76	64	60.7	70	ne.	2	2	30.11	30.00	0.00
26	29.99	69	62	78	66	60.3	70	ne.	2-0	2	30.08	29.98	0.00
27	29.97	67	65.3	76	65	60.0	67	nne.	3-0	5-2	30.06	29.95	1.27
28	30.10	69	61	72	65	61.7	82	nne.	1-5	2-6	30.13	29.99	0.42
29	30.14	69	60.5	73	66	57.5	68	ne.	5-6	10-6	30.18	30.07	0.12
30	30.15	69	61	73	65	54.0	58	ne.	6-7	7	30.19	30.12	0.12
31	30.15	70	62	74	65	56.5	62	ne.	6-5	7	30.22	30.10	0.00
Sums													4.05
Means	30.006	67.0	62.7	75.5	63.5	60.5	73.8		2.1	4.5	30.074	29.958	
Departure	+ .055					-2.2	-3.0			+0.1			+0.95

Mean temperature for January, 1903, (6 + 2 + 9) ÷ 3 = 69.8; normal is 70.2. Mean pressure for January, 1903, (9 + 3) ÷ 2 = 30.02; normal is 29.965.

*This pressure is as recorded at 1 p. m., Greenwich time. †These temperatures are observed at 6 a. m., local, or 4.31 p. m., Greenwich time. ‡These values are the means of (6 + 9 + 2 + 9) ÷ 4. §Beaufort scale.

Maximum thermometer set at 9 p. m. and minimum at 2 p. m., local time.

GENERAL SUMMARY FOR JANUARY, 1903.

Honolulu.—Temperature mean for the month, 69.8°; normal, 70.2°; average daily maximum, 75.5°; average daily minimum,

63.5°; mean daily range, 12.0°; greatest daily range, 19.0°; least daily range, 5°; highest temperature, 79°; lowest, 56°.

Barometer average, 30.020; normal, 29.965; highest, 30.22, 30th; lowest, 29.72, 8th; greatest 24-hour change, that is, from any given hour on one day to the same hour on the next, 0.17; lows passed this point on the 7th and 26th; highs on the 4th, 21st, and 30th.

Relative humidity average, 73.8 per cent; normal, 76.8 per cent; mean dew-point, 60.5°; normal, 62.7°; mean absolute moisture, 5.89 grains per cubic foot; normal, 6.27 grains. There was again an unusual period of low dew-point at the end of the month. Dew on grass, 12 mornings.

Rainfall data for January, 1903.

Stations.			Stations.		
HAWAII.			OAHU.		
HILO, e. and ne.			Punahou (W. B.), sw.		
Feet.	Inches.		Feet.	Inches.	
Waiakae	50	3.39	Kulaokahua (Castle), sw.	50	2.66
Hilo (town)	100	4.46	Makiki Reservoir	120	3.36
Kaunama	1,250		U. S. Naval Station, sw.	6	0.91
Peepeeke	100	7.14	Kapiolani Park, sw.	10	2.30
Hakalau	200	8.88	College Hills	175	2.70
Honohina	300	10.87	Manoa (Woodlawn Dairy), c.	285	5.75
Puuhou	1,050	20.52	Manoa (Rhodes Gardens)	360	7.37
Laupahoehoe	500	13.76	School street (Bishop), sw.		
Ookala	400	11.34	Insane Asylum, sw.	30	2.93
HAMAKUA, ne.			Kamehameha School	75	
Kukaiau	250	12.96	Kalihi-Uka, sw.	485	6.95
Paaui	300	11.42	Nuuanu (W. W. Hall), sw.	50	2.86
Paauihau (Mill)	300	8.42	Nuuanu (Wyllie street)	250	3.86
Honokaa (Muir)	425	9.07	Nuuanu (Elec. Station), sw.	405	4.05
Honokaa (Meinicke)	1,100		Nuuanu (Luakaha), c.	850	9.64
Kukuihaele	700	11.44	U. S. Experiment Station	350	3.21
KOHALA, n.			Laniakaa (Nahuia)	1,150	5.26
Niulii	200		Tantalus Heights	1,360	3.71
Kohala (Mission)	521	3.72	Waimanalo, ne.	300	4.00
Kohala (Sugar Co.)	270	2.50	Kaneohe	100	3.90
Hawi, Mill	700	2.81	Maunawili, ne.	300	6.73
Puakea Ranch	600	2.88	Ahuimanu, ne.	350	6.79
Puuhue Ranch	1,847	10.10	Kahuku, n.	25	1.54
Waimea	2,720	6.23	Waialua	37	1.96
KONA, w.			Wahiawa	900	
Holualoa	1,350		Ewa Plantation, s.	60	1.39
Kealakakua	1,580	4.92	U. S. Magnetic Station	45	1.28
Napooopo	25	3.62	Waipahu	200	0.42
Hoopuloa	1,650	2.74	Moanalua	15	4.46
KAU, se.			KAUAI.		
Kahuku Ranch	1,680		Lihue (Grove Farm), e.	200	1.85
Honuaopo	15	0.82	Lihue (Molokoa), e.	300	2.30
Naalehu	650	2.40	Lihue (Kukaua), e.	1,000	2.22
Hilea	310	1.40	Kealia, e.	15	1.23
Pahala	850	3.20	Kilauea, ne.	325	2.40
Mosula			Hanalei, n.	10	3.61
Volcano House	4,000	4.24	Waiole	10	3.66
PUNA, e.			Haena	15	
Olaa, Mountain View (Russel)	1,690	6.38	Waiawa	32	2.22
Kapoho	110	11.07	Elele	150	1.87
Pahoa	600	7.15	Wahiawa (Mountain)	3,000	6.95
MAUI.			McBryde (Residence)	850	3.16
Lahaina	40	0.20	Lawai (Gov. Road)	450	2.03
Waioape Ranch	700		Lawai, w.	225	1.20
Kaupo (Mokulau), s.	285	4.31	Lawai, e.	800	1.50
Kipahulu, s.	308	5.07	Kola	100	0.71
Nahiku, ne		18.99*	Delayed December reports.		
Nahiku	1,600		Wahiawa (Oahu)	10	15
Haiku, n.	700	12.20	Hawi (Kohala)	13	91
Kula (Erehwon), n.	4,500	3.04	Laupahoehoe	27	20
Kula (Waiakeoa), n.	2,700	2.35	Waioape	4	99
Puomalei, n.	1,400	16.05	Nahiku	1,600	44.31
Paia	180	12.32			
Haleakala Ranch	2,000				
Wailuku, ne.	250	7.32			

*Record from 1st to 20th only.

NOTE.—The letters n, s, e, w, and c show the exposure of the station relative to the winds.